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Curing and Storage Methods in Relation to Quality of Porto Rico Sweetpotatoes

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CONTENTS

	Page
Ventilation during curing usually nonessential	1
Recommended practices	2
Review of literature	3
Materials and methods	4
Results	5
Loss from decay	5
Results—Continued.	
Loss in weight from respiration and transpiration	8
Quality as affected by curing and storage conditions	9
Literature cited	12

VENTILATION DURING CURING USUALLY NONESSENTIAL

The previous general recommendations for curing sweetpotatoes are to provide adequate ventilation and to maintain temperatures of 80° to 85° F. and relative humidities of 85 to 90 percent for 10 to 14 days (*11*).[1] After the curing period the temperature of the storage room is allowed to drop to 55° and the humidity to 75 to 80 percent.

The humidity recommendation is based on work (*2*) showing that the cut surfaces of sweetpotato roots heal more readily at high humidities. The one for ventilation is based on the old idea that the object of curing is to dry the sweetpotatoes; in fact, many people still erroneously call curing "kiln drying." The common recommendation for ventilation is to keep the ventilators open during the curing period. Throughout most of the South a curing temperature of 85° F. can be maintained during the fall only if the storage room is heated. Therefore it is difficult if not impossible to maintain the necessary high humidity because when the outside cold air brought in through the open ventilators is warmed its relative humidity is lowered. In several sweetpotato houses near Meridian, Miss., the highest average humidity found during the curing period was 80 percent and the lowest 60 percent. Humidity may be below the ideal even though an effort is made to increase it by using an earth floor and hanging wet sacks in the curing room. Edmond and Dunkelberg (*4*) were able to obtain high humidity during curing by the application of water to the clay floor in their storage house. Cordner (*3*), working in Oklahoma on the influence of temperature of curing on sweetpotatoes, found that

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[1] Italic numbers in parentheses refer to Literature Cited, p. 12.

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the humidity during curing in his experimental, ventilated chambers was only about 70 percent at the beginning of the curing period and 36 percent at the end.

The fairly large scale experiments described in this circular were undertaken to determine whether a more desirable humidity for curing could be obtained by reducing or eliminating ventilation. Also such elimination would reduce costs, especially in electrically heated storage houses, as it would not be necessary to heat cold air entering through the ventilators.

In addition, experiments to determine the influence of various fluctuating temperatures, such as those prevailing in practice, on the quality of the Porto Rico sweetpotatoes cured under various conditions were undertaken. Although the usual recommendation for storage after curing is to keep the temperature at 50° to 55° F. or higher, Lauritzen (7), working at constant storage temperatures, found that Jersey sweetpotatoes could be held between 49° and the freezing point of the roots for 10 days or less. In most of the South the temperature of well-built storage houses will remain at about 50° or above except during very cold weather, and many farmers do not heat their storage houses after the end of the curing period.

In these experiments it was found that during the curing of Porto Rico sweetpotatoes ventilation is generally nonessential, wastes heat, and causes too low relative humidities for proper curing; such improperly cured sweetpotatoes keep poorly in storage. The best practice seems to be to use just enough ventilation during the curing period to prevent condensation of moisture on the roots and on the ceiling and sides of the storage house. Circulation of air during the curing period does not seem necessary and may be injurious.

Sweetpotatoes stored at a minimum temperature of 50° F. after being cured were of higher table quality than those stored at minima of 40° and 30°. Those stored at 40° did not differ significantly in keeping quality from those stored at 50°. Sweetpotatoes stored at a minimum temperature of 30° decayed much more than those at the higher temperatures.

Careful handling prior to curing was an important factor in reducing losses during curing and storage.

RECOMMENDED PRACTICES

During the curing period (10 to 14 days)—

(1) Maintain a temperature of 80° to 85° F.

(2) Maintain a relative humidity of 85 to 90 percent to promote healing and reduce shrinkage.

(3) Keep the ventilators shut except when it is necessary to open them to prevent condensation of moisture. If the temperature is properly controlled, there is little danger of the humidity being too high during the curing period.

During the subsequent storage period—

(1) Keep temperature between 50° and 55° F.; if the temperature goes below 48°, heat should be used to raise it to 55°; if it approaches 60°, the ventilators should be opened in the cool of the day or at night until the temperature is 54° or 55°.

(2) Maintain a relative humidity of 80 to 85 percent. If the walls, ceiling, or sweetpotatoes become wet, it may be necessary to open the ventilators to remove the excessively moist air but they should be closed before the humidity is reduced too much. If moisture condenses on the walls in cold weather when the humidity and temperature within the storage house are right, better insulation of the walls is necessary.

REVIEW OF LITERATURE

Weimer and Harter (*14*) found that periderm formation in the sweetpotato takes place very rapidly at high humidity (96 percent) at 33° C. (91.4° F.). They also found that the healed surface of a wounded sweetpotato forms an effective barrier against infection by micro-organisms. They suggested that the suberization of the surface cell walls is a factor in preventing the entrance of micro-organisms and that even the drying out of the injured cells may exert some retarding or inhibiting action against such organisms.

Lauritzen and Harter (*9*) reported that resistance to infection by *Rhizopus* was developed in halved roots of sweetpotatoes that had been held at relative humidities of 89 to 97 percent. They found this resistance to be located in the surface layers of the wounded areas and suggested that it has a possible relation to cork formation.

Artschwager and Starrett (*2*) found wound-periderm formation in Yellow Jersey sweetpotatoes after 3 days at relative humidities of 90.6 and 95 percent at temperatures around 84° F. The rate of wound-periderm formation decreased with decreasing humidity. None was formed after 11 days at a relative humidity of 66 percent at this temperature, although suberization occurred after 5 days. Wound-periderm formation was preceded by suberization in all cases, the most rapid development being at 31.7° C. (89.1° F.). The rate of suberization and wound-periderm formation generally decreased with decreasing temperatures. The lowest temperature at which they observed wound-periderm formation was 12.5° C. (54.5° F.), but the process was very slow at this temperature.

Lauritzen (*8*) in a study of factors affecting infection and decay of sweetpotatoes found that, although a suberin layer seemed to inhibit and sometimes prevent infection by various fungi, a wound-periderm layer is an effective barrier against infection by various storage rot fungi and retards the loss of moisture and consequent shriveling.

It has been shown by Lutz (*10*) that the relative humidity of the air immediately surrounding sweetpotatoes in the interior of a package during curing is nearly always higher than that of the air of the room outside the package. Kimbrough (*5*) reported that it is possible to cure sweetpotatoes in southern Louisiana without artificial heat by taking advantage of natural heat prevailing in that district during October.

In a study on the effects of chilling temperatures on sweetpotatoes, Lauritzen (*7*), working with the Yellow Jersey and Yellow Jersey Improved varieties of sweetpotatoes, found that at temperatures below 9° C. (48.2° F.) they are susceptible to infection, which does not normally occur at temperatures above this. Infection occurred at these low temperatures as well as after removal from the low temperature to the usual storage temperature for sweetpotatoes (above 50° F.). In some cases infection took place at the higher temperatures when it was not evident at the end of the chilling period. Besides being susceptible to invasion by decay organisms, sweetpotatoes showed internal browning at the low temperatures. In some cases this browning did not become evident until the potatoes were later subjected to temperatures of 10° to 25° C. (50° to 77° F.). The effects of low temperature on decay and internal discoloration occurred at temperatures above the average freezing point (28.5° F.) of sweetpotatoes (*16*).

Kimbrough and Bell (*6*) reported that Porto Rico sweetpotatoes subjected to constant storage temperatures of 40° F. or lower for 1 week are injured. The freezing points of several varieties of sweetpotatoes are given by Wright (*16*). The average freezing points range from 27.6° to 29°. The influence of variety on the keeping quality of sweetpotatoes in storage has been reported by Thompson and Beattie (*12*) and Woodard (*15*).

Thompson and Beattie (*12*) and Anderson and Edmond (*1*) pointed out the importance of careful handling and the avoidance of cuts and bruising injury in preventing losses from shrinkage and decay in storage. Suggestions for the storage of sweetpotatoes and sweetpotato-house construction are given by Thompson et al. (*13*).

MATERIALS AND METHODS

The present experiments were conducted during three seasons, 1940–41, 1941–42, and 1942–43, at the United States Department of Agriculture Horticultural Field Station, Meridian, Miss., with sweetpotatoes grown in that vicinity. The Porto Rico variety was used, as it is the principal variety grown in the South.

The sweetpotatoes were cured in electrically heated, thermostatically controlled sweetpotato storage rooms in which the thermostat was set to maintain an average temperature of 85° F. The length of the curing period was 11 days in 1940 and 12 days in 1941 and 1942. Noncured sweetpotatoes kept in an unheated shed were compared with sweetpotatoes cured under the following humidity and ventilation conditions:

(1) Ventilation without humidity control. During the curing period the top and bottom ventilators were kept open. As the room was not entirely full, the humidity was probably somewhat lower than it would be under commercial conditions. This method is referred to as low humidity curing.

(2) Ventilation at high humidity. Same as the preceding treatment except that a humidifier maintained a fairly high relative humidity.

(3) Without ventilation. Room was almost full of sweetpotatoes, and the ventilators were kept closed.

(4) Without ventilation but with air circulation. Conditions the same as in the preceding treatment except that an electric fan circulated the air within the room.

The sweetpotatoes were placed in the various curing conditions the day after they were harvested. A record of the temperature and humidity for each of the curing and storage treatments was obtained by means of hygrothermographs placed at each of the curing and storage conditions. These were checked against wet- and dry-bulb psychrometers at weekly intervals. The average temperature and humidity maintained for each curing method in each of the 3 years are given in table 1.

TABLE 1.—*Average temperatures and humidities under various curing methods*

Method of curing	Temperature			Relative humidity		
	1940	1941	1942	1940	1941	1942
	°F.	*°F.*	*°F.*	*Percent*	*Percent*	*Percent*
Not cured	76. 9	59. 8	64. 7	73. 5	57. 5	68. 5
Ventilation without humidity control	85. 1	83. 5	84. 7	60. 0	41. 0	47. 8
Ventilation at high humidity	81. 2	83. 5	84. 0	87. 3	77. 5	78. 7
Without ventilation	85. 4	85. 3	85. 8	89. 9	68. 9	76. 5
Without ventilation but with air circulation	85. 8	83. 8	83. 4	75. 4	74. 4	79. 4

After being cured the sweetpotatoes from each curing treatment were subdivided into three lots and placed in rooms in a sweetpotato storage house with the thermostat set for the following minimum temperatures: 50°, 40°, and 30° F. The temperatures in these rooms fluctuated with the outside temperature, but the thermostat in each was set so that heat was turned on as soon as the temperature reached the minimum temperature that it was set for. The record of temperatures and relative humidities for each of the three rooms during each of the three seasons is given in table 2.

TABLE 2.—*Temperatures and average relative humidities in sweetpotato storage rooms*

Minimum temperature of thermostat setting (°F.)	Season	Average relative humidity	Temperature		Period at indicated temperature (°F.)		
			Average	Minimum actually reached	Below 40	40–50	Below 50
		Percent	*°F.*	*°F.*	*Hours*	*Hours*	*Hours*
30	1940–41	60.5	53.4	39.0	7	737	744
	1941–42	80.1	50.5	30.5	324	988	1,312
	1942–43	88.1	53.9	30.0	129	1,085	1,214
40	1940–41	80.9	54.5	43.0	0	510	510
	1941–42	81.4	53.0	40.0	0	822	822
	1942–43	87.5	55.5	42.0	0	728	728
50	1940–41	78.2	57.9	46.0	0	40	40
	1941–42	74.0	56.0	48.0	0	11	11
	1942–43	83.6	57.7	48.0	0	11	11

The temperature in the 50° F. room dropped a little below the desired minimum on one or two occasions each year because the electricity was off or the thermostat failed, but it remained below the thermostat setting for only a short time.

The sweetpotatoes were kept in half-bushel baskets during both curing and storage. In 1940 only carefully handled sweetpotatoes were used. In 1941 and 1942 both carefully and carelessly handled roots were used, making a total of 5 tests. Three baskets of sweetpotatoes were used for each curing method at each subsequent storage temperature for each of the 5 tests, making a total of 15 baskets for each individual treatment, of 45 baskets for each curing method, and of 75 for each storage treatment. They were inspected after storage for 4 to 5 months.

TABLE 3.—*Effect of curing methods and minimum temperatures of subsequent storage on decay of Porto Rico sweetpotatoes*

[Individual averages of 15 baskets in 5 tests]

Curing method	Decay at indicated minimum storage temperature (° F.)[1]			
	50	40	30	Average
	Percent	*Percent*	*Percent*	*Percent*
Not cured	14.7	14.1	19.0	15.9
Ventilation without humidity control	9.7	13.8	17.1	13.5
Ventilation at high humidity	5.4	4.7	4.5	4.9
Without ventilation	5.6	4.5	6.6	5.6
Without ventilation but with air circulation	6.5	6.4	12.6	8.5
Average	8.4	8.7	12.0	----------

[1] Minimum difference required for significance: Between individual values, 3.5; between curing methods (averages of all 3 temperatures), 2.0; between storage temperatures (averages of all 5 curing methods), 1.6.

RESULTS

LOSS FROM DECAY

EFFECT OF TEMPERATURE AND HUMIDITY

The influence of method of curing and storage on decay is shown in table 3. (See table 9 for analysis of variance.) The average differences between the various curing methods are significant in all cases except that between ventilation at high humidity and no ventilation. The percentages of decay under both these curing methods were considerably less than one-half that under ventilation without humidity control. Average decay under this treatment was nearly as great as in the noncured lots. Although the humidity under ventilation without humidity control was probably somewhat lower than is found in commercial practice, because of the smaller quantity of sweetpotatoes in relation to the air space in the curing room, the experiment furnishes definite evidence that it is undesirable to cure sweetpotatoes under ventilation when the latter causes an undue lowering of the humidity.

The average percentage of decay in the curing method in which air circulation within the curing room was provided was somewhat higher than where there was no circulation. This is probably due to a lower relative humidity immediately surrounding sweetpotatoes under this condition than would have existed if there had been no air circulation (*10*). There may be cases in commercial practice in which circulating air might be desirable to obtain uniform heat distribution.

The average percentage of decay in sweetpotatoes stored in a room in which the temperature was allowed to drop to 30° F. was significantly higher than in those stored in rooms held at a minimum temperature of 40° or 50°. There was no significant difference in the decay of sweetpotatoes stored at minimum temperature of 40° and 50°, but, as pointed out on page 11, allowing the temperature to drop to 40° had an adverse effect on quality. It is possible that in a cooler climate the temperature in a room maintained at a minimum temperature of 40° would be below 50° for a larger percentage of the time than was the case in these experiments. In such a case there might be more decay at a 40° minimum than at a 50° minimum storage temperature.

Proper curing seems to prevent decay which would otherwise occur at low temperatures. There was no significant difference in decay between the three minimum storage temperatures in sweetpotatoes cured where humidity was high. On the other hand, noncured sweetpotatoes had significantly more decay when stored at a minimum temperature of 30° F. than when stored at higher temperatures, and sweetpotatoes cured at low humidity had significantly more decay when stored at 30° and 40° minimum temperatures than when stored at a minimum temperature of 50°.

EFFECT OF CARBON DIOXIDE AND EXTREMELY HIGH HUMIDITY DURING CURING

In the experiments just described the room used for curing without ventilation was fairly tight, being constructed of tongue-and-groove lumber and lined with building paper. The baskets in which the sweetpotatoes were stored occupied approximately two-thirds of the space and the sweetpotatoes themselves about one-third. The maximum carbon dioxide content recorded during curing under this condition was 1.2 percent and the minimum oxygen content was 19.8 percent.

To determine what the effect would be if sweetpotatoes were cured under conditions in which they occupied a space completely except for the interstices between the roots, during each of the 3 years a tight wooden box lined with building paper was completely filled with sweetpotatoes and the cover was fastened tightly. This box was held in an 85° F. room during the curing period. In 1940 only 3 half-bushel baskets of sweetpotatoes were treated in this manner. In 1941 and again in 1942, 12 half-bushel baskets of sweetpotatoes were used. Half of these were carefully handled and half carelessly handled prior to curing. After being cured the roots were subdivided again, half being stored at a minimum temperature of 50° and the other half at 40°. The maximum carbon dioxide concentration during curing in this tight box was 2.7 percent and the minimum oxygen content was 18.3 percent. In each case an equal quantity of sweetpotatoes was cured under ventilation at high humidity for comparison. The average percentage of decay in the 9 tests at the end of the storage period was 5.2 percent in the sweetpotatoes cured in the tight box and 6.6 percent in the high-humidity, ventilated check. This difference was not statistically significant. The humidity in the tight wooden box during curing was probably close to 100 percent, as many of the sweetpotatoes were wet and moisture had condensed on the top and sides of the box during the curing period.

To obtain further evidence on the influence of carbon dioxide and extremely high humidity, 12 baskets of sweetpotatoes were cured in 1942 in a tight metal box with a water seal with only enough ventilation to prevent the carbon dioxide content in the box from rising above a maximum of 14.6 percent. The average carbon dioxide content during curing under this condition was 11 percent. The oxygen content averaged 10 percent and reached a minimum of 7.4 percent. Half of the sweetpotatoes were carefully handled prior to curing and half carelessly handled. After curing, half of each lot was stored at a minimum storage temperature of 50° F. and the remainder at 40°. The sweetpotatoes were compared with those in 12 baskets handled in an identical manner except for being cured in a tight wooden box and also 12 baskets cured under ventilation at high humidity. The average percentage of decay at the end of the storage period following the three methods of curing is given in table 4.

Table 4.—*Effect of curing methods on decay of sweetpotatoes*

[Each percentage based on average of 12 baskets]

Method of curing	Average carbon dioxide content	Sweetpotatoes decayed
	Percent	*Percent*
Tight metal box	11.0	9.8
Tight wooden box	.9	11.2
Ventilation and high humidity	0	11.8

These differences between treatments are not statistically significant. There was, however, a slight adverse effect on the flavor of sweetpotatoes cured in the tight metal box with an average carbon dioxide content of 11 percent. There was no adverse effect on the quality of sweetpotatoes cured in the tight wooden box where the maximum carbon dioxide content was 2.7 percent, or in the ventilated room where none was present.

These experiments show that ventilation during curing of sweetpotatoes is generally unnecessary and that better humidity conditions are obtained by providing only enough ventilation to prevent free moisture from condensing. Only where there was no ventilation at all and the carbon dioxide built up excessively was there an effect on flavor. Eliminating or greatly reducing ventilation also resulted in considerable savings in heat. This is an especially important item when electricity is used as a source of heat. In many cases no ventilation whatever during curing would be necessary.

Although in these experiments allowing the relative humidity during curing to rise to 100 percent caused no increase in decay, it is recommended that in commercial practice only sufficient ventilation be provided to prevent condensation of moisture, because many of the potatoes when cured in the tight wooden box or the tight metal box were wet and moisture had condensed on the top and sides of the boxes. Allowing the potatoes to become wet during curing impairs their appearance and might make them more subject to decay, and condensation on the ceiling and sides of the storage house would probably shorten the life of the building.

Loss in Weight From Respiration and Transpiration

The average loss in weight during curing and storage for the five tests is given in table 5. (See table 9 for analysis of variance.) The values of the different curing methods are essentially the same for preventing loss of weight as loss by decay. The loss in weight in the 40° F. minimum storage was slightly less than in the other two storages, but the differences were not great.

It was observed in the carelessly handled noncured sweetpotatoes that the skinned areas did not heal so well and were more sunken in sweetpotatoes stored at a minimum temperature of 30° F. than in

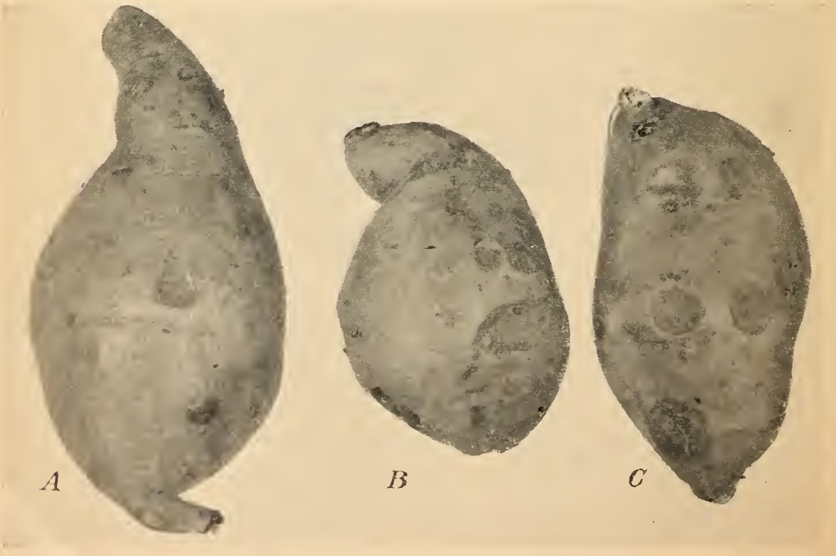
Table 5.—*Effect of curing methods and minimum temperatures of subsequent storage on loss in weight of Porto Rico sweetpotatoes*

[Individual averages of 15 baskets in 5 tests]

Curing method	Loss in weight at indicated minimum storage temperature (°F.)[1]			
	50	40	30	Average
	Percent	*Percent*	*Percent*	*Percent*
Not cured	18.3	17.0	18.0	17.8
Ventilation without humidity control	17.6	16.1	17.8	17.2
Ventilation at high humidity	11.2	10.6	11.8	11.2
Without ventilation	11.8	10.4	11.0	11.1
Without ventilation but with air circulation	12.9	12.4	14.0	13.1
Average	14.4	13.3	14.5	

[1] Minimum difference required for significance: Between individual values, 1.3; between curing methods (averages of all 3 storage temperatures), 0.8; between storage temperatures (averages of all 5 curing methods), 0.6.

Figure 1.—Noncured Porto Rico sweetpotatoes stored for 4½ months at the indicated minimum temperatures: *A*, 50° F.; *B*, 40°; and *C*, 30°.



those at 40° and less of this injury occurred at the 50° than at the 40° minimum storage temperature (fig. 1). Cured sweetpotatoes showed almost no injury.

Since the data in tables 3 and 5 are based on the original weight of the various lots of sweetpotatoes, it was possible to determine the total loss that would be encountered during storage as a result of decay and loss in weight due to respiration and transpiration of the roots. These data are presented in table 6. (See table 9 for analysis of variance.)

TABLE 6.—*Effect of curing methods and minimum temperatures of subsequent storage on total loss (loss by decay plus loss in weight) of careless and carefully handled Porto Rico sweetpotatoes*

[Individual averages of 15 baskets in 5 tests]

Curing method	Total loss at indicated minimum storage temperature (° F.)[1]			
	50	40	30	Average
	Percent	*Percent*	*Percent*	*Percent*
Not cured	33.0	31.1	37.0	33.7
Ventilation without humidity control	27.2	29.8	35.0	30.7
Ventilation at high humidity	16.6	15.3	16.3	16.0
Without ventilation	17.4	15.0	17.6	16.7
Without ventilation but with air circulation	19.4	18.9	26.5	21.6
Average	22.7	22.0	26.5	

[1] Minimum difference required for significance: Between individual values, 4.2; between curing methods (averages of all 3 storage temperatures), 2.4; between storage temperatures (averages of all 5 curing methods), 1.9.

It can be noted that the total loss in the noncured lots averaged 33.7 percent. In other words, of 100 pounds of sweetpotatoes placed in storage only 66.3 pounds remained marketable at the end of the storage period of 4 to 5 months. Curing under ventilation at low humidity resulted in nearly as great a loss as no curing. Curing at high humidity resulted in approximately half as much loss as in the noncured lots and only slightly over half the loss that occurred in lots cured at low humidity. There was no significant difference between curing without ventilation, in which case the humidity was doubtless maintained by evaporation from the sweetpotatoes, and curing with ventilation where the humidity was maintained by a mechanical humidifier.

The loss during curing and storage was somewhat more when the sweetpotatoes were stored at a minimum temperature of 30° F. than when the storage temperature was higher.

The total loss (loss in weight plus loss by decay) of the three carefully handled lots is given in table 7. Except for the smaller losses when the sweetpotatoes were handled carefully the relative influence of curing methods and storage temperatures is essentially the same as that presented in table 6. Such smaller losses indicate the importance of careful handling in reducing losses in storage. (See table 9 for analysis of variance.)

Quality as Affected by Curing and Storage Conditions

To determine the influence of the various curing and storage treatments, five medium-sized roots from each treatment were baked in the oven of an electric range for 1 hour and 20 minutes at 400° F. Ratings on flesh color, texture, and flavor were made. A numerical rating of 1 was used to denote excellent; 2, good; 3, fair; 4, poor; and 5, very poor. In addition, ratings on color of raw flesh were made in the same manner during the last two seasons of work. The color ratings were based on freedom from discoloration, texture ratings on freedom from

TABLE 7.—*Effect of curing methods and minimum temperatures of subsequent storage on total loss (loss by decay plus loss in weight) of carefully handled Porto Rico sweetpotatoes*

[Individual averages of 9 baskets in 3 tests]

Curing method	Total loss at indicated minimum storage temperature (° F.)[1]			
	50	40	30	Average
	Percent	*Percent*	*Percent*	*Percent*
Not cured	21.7	21.1	23.5	22.1
Ventilation without humidity control	18.9	23.2	26.2	22.8
Ventilation at high humidity	12.8	12.8	14.5	13.4
Without ventilation	14.6	14.2	15.7	14.8
Without ventilation but with air circulation	15.9	15.2	22.3	17.8
Average	16.8	17.3	20.4	

[1] Minimum difference required for significance: Between individual values, 4.0; between curing methods (averages of all 3 storage temperatures), 2.3; between storage temperatures (averages of all 5 curing methods), 1.8.

hardness, and flavor ratings on the presence of desirable and the lack of off, or undesirable, flavors. The ratings for the various quality criteria are given in table 8. (See table 9 for analysis of variance.)

Although the quality ratings were in general slightly higher when the sweetpotatoes were cured under high humidity conditions than when they were cured at low humidity, the differences between different methods of curing are in no case statistically significant.

Color and flavor averaged significantly better in sweetpotatoes stored at a minimum temperature of 50° F. than in those stored at a

TABLE 8.—*Effect of curing methods and minimum temperatures of subsequent storage on quality of Porto Rico sweetpotatoes*

[Averages of 2-year tests for raw flesh and 3-year tests for other qualities]

Curing method	Rating for color of raw flesh after storage at indicated minimum temperatures (° F.)				Rating for color of flesh when baked after storage at indicated minimum temperature (° F.)			
	50	40	30	Average	50	40	30	Average
Not cured	1.65	2.05	2.80	2.17	1.47	1.53	2.30	1.77
Ventilation without humidity control	1.45	2.10	2.85	2.13	1.33	1.77	2.87	1.99
Ventilation at high humidity	1.60	1.75	2.65	2.00	1.33	1.83	2.27	1.81
Without ventilation	1.50	1.65	2.70	1.95	1.23	1.50	2.47	1.73
Without ventilation but with air circulation	1.25	1.70	2.70	1.88	1.30	1.70	2.83	1.94
Average	1.49	1.85	2.74		1.33	1.67	2.55	
Minimum difference required for significance:								
Between individual values	0.56				0.56			
Between storage temperatures (average of all 5 curing methods)	.25				.25			

Curing method	Rating for texture when baked after storage at indicated minimum temperature (° F.)				Rating for flavor when baked after storage at indicated minimum temperature (° F.)			
	50	40	30	Average	50	40	30	Average
Not cured	1.17	1.33	1.37	1.29	1.70	1.77	2.57	2.01
Ventilation without humidity control	1.10	1.13	1.77	1.33	1.33	2.07	2.87	2.09
Ventilation at high humidity	1.20	1.27	1.53	1.33	1.23	1.77	2.80	1.93
Without ventilation	1.17	1.20	1.30	1.22	1.37	1.97	2.67	2.00
Without ventilation but with air circulation	1.10	1.27	1.30	1.22	1.43	1.87	2.90	2.07
Average	1.15	1.24	1.45		1.41	1.89	2.76	
Minimum difference required for significance:								
Between individual values	0.35				0.52			
Between storage temperatures (average of all 5 curing methods)	.16				.23			

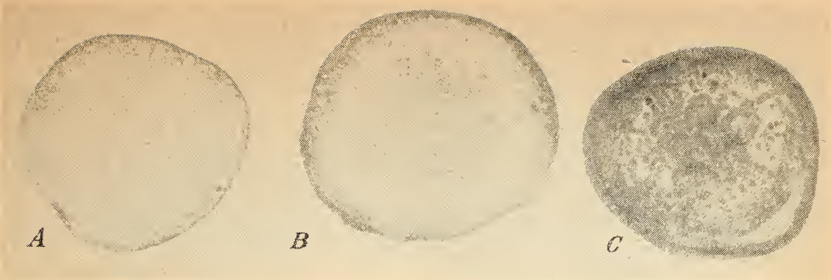


FIGURE 2.—Sections of noncured Porto Rico sweetpotatoes stored at the indicated minimum temperatures: *A*, 50° F.; *B*, 40°; *C*, 30°. Note that most discoloration occurred at 30° and least at 50°.

minimum temperature of 40°. Likewise, color and flavor of sweetpotatoes stored at a minimum temperature of 40° averaged significantly better than in those stored at a minimum temperature of 30°. The effect of minimum storage temperature on discoloration is illustrated in figure 2.

Texture was only slightly influenced by storage temperature, but there was significantly less softening of the flesh during baking in sweetpotatoes stored at a minimum temperature of 30° than in those stored at higher temperatures.

These results are interesting in view of the results reported in table 3 in which there was no significant difference in decay between storage at a minimum temperature of 50° and one of 40° F. It is apparent that although storage under conditions which permit temperatures to drop to as low as 40° may not result in increased decay, it may have an injurious effect on quality.

TABLE 9.—*Analysis of variance for data presented in tables 3, 5, 6, 7, and 8* [1]

Source of variation	Decay (table 3)		Weight loss (table 5)		Total loss in storage (table 6)		Total loss in storage (carefully handled tests) (table 7)	
	Degrees of freedom	Mean square	Degrees of freedom	Mean square	Degrees of freedom	Mean square	Degrees of freedom	Mean square
Total	224	102.08	224	23.72	224	193.89	134	69.48
Curing methods	4	1,070.22**	4	468.15**	4	2,942.08**	4	477.78**
Storage	2	293.49**	2	32.48**	2	428.76**	2	177.50**
Tests	4	2,634.62	4	456.55	4	4,629.05	2	2,039.10
Tests×curing	16	146.12**	16	52.69**	16	349.12**	8	117.03**
Tests×storage	8	33.35	8	15.20**	8	19.79	4	6.98
Curing×storage	8	56.74*	8	2.60	8	62.83	8	27.91
Curing×storage×tests	32	25.98	32	2.60	32	30.68	16	10.88
Replications in subclasses (error)	150	23.80	150	3.21	150	33.74	90	17.83

Source of variation	Color of raw flesh (table 8)		Color of flesh when baked (table 8)		Texture when baked (table 8)		Flavor when baked (table 8)	
	Degrees of freedom	Mean square	Degrees of freedom	Mean square	Degrees of freedom	Mean square	Degrees of freedom	Mean square
Total	149	0.70	224	0.99	224	0.28	224	0.93
Curing methods	4	.44	4	.56	4	.14	4	.16
Storage	2	20.70**	2	29.47**	2	1.36**	2	35.00**
Tests	1	6.40	2	6.43	2	1.46	2	3.24
Tests×curing	4	.14	8	.36	8	.44	8	.45
Tests×storage	2	.36	4	5.42**	4	.26	4	4.78**
Curing×storage	8	.16	8	.55	8	.29	8	.42
Curing×storage×tests	8	.43	16	.63	16	.39	16	.75
Replications in subclasses (error)	120	.40	180	.60	180	.24	180	.52

[1] *=Significant; **=highly significant.

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